Meta-Analysis

The Great Debate

- 1952: Hans J. Eysenck concluded that there were no favorable effects of psychotherapy, starting a raging debate
- 20 years of evaluation research and hundreds of studies failed to resolve the debate
- 1978: To proved Eysenck wrong, Gene V. Glass statistically aggregate the findings of 375 psychotherapy outcome studies
- Glass (and colleague Smith) concluded that psychotherapy did indeed work
- Glass called his method “meta-analysis”

The Logic of Meta-analysis

- Traditional methods of review focus on statistical significance testing
- Significance testing is not well suited to this task
  - Highly dependent on sample size
  - Null finding does not carry the same "weight" as a significant finding
    - significant effect is a strong conclusion
    - nonsignificant effect is a weak conclusion
- File drawer issue
- Meta-analysis focuses on the ***direction*** and ***magnitude*** of the effects across studies, not statistical significance
  - Isn't this what we are interested in anyway?
  - Direction and magnitude are represented by the effect size

When Can You Do Meta-analysis?

- Meta-analysis is applicable to collections of research that
  - Are empirical, rather than theoretical
  - Produce quantitative results, rather than qualitative findings
  - Examine the same constructs and relationships
  - Have findings that can be configured in a comparable statistical form (e.g., as effect sizes, correlation coefficients, odds-ratios, proportions)
  - Are “comparable” given the question at hand

Forms of Research Findings Suitable to Meta-analysis

- Central tendency research
  - Prevalence rates
- Pre-post contrasts
  - Growth rates
- Group contrasts
  - Experimentally created groups
    - Comparison of outcomes between treatment and comparison groups
  - Naturally occurring groups
    - Comparison of spatial abilities between boys and girls
    - Rates of morbidity among high and low risk groups

Forms of Research Findings Suitable to Meta-analysis

- Association between variables
  - Measurement research
    - Validity generalization
  - Individual differences research
    - Correlation between personality constructs

Effect Size: The Key to Meta-analysis

- The effect size makes meta-analysis possible
  - It is the “dependent variable”
  - It standardizes findings across studies such that they can be directly compared

Effect Size: The Key to Meta-analysis

- Any standardized index can be an “effect size” (e.g., standardized mean difference, correlation coefficient, odds-ratio) as long as it meets the following
  - Is comparable across studies (generally requires standardization)
  - Represents the magnitude and direction of the relationship of interest
  - Is independent of sample size
- Different meta-analyses may use different effect size indices

The Replication Continuum

- You must be able to argue that the collection of studies you are meta-analyzing examine the same relationship.
- The closer to pure replications your collection of studies, the easier it is to argue comparability.

Which Studies to Include?

- It is critical to have an explicit inclusion and exclusion criteria
  - The broader the research domain, the more detailed they tend to become
  - Refine criteria as you interact with the literature
  - Components of a detailed criteria
    - distinguishing features
    - research respondents
    - key variables
    - research methods
    - cultural and linguistic range
    - time frame
    - publication types

Methodological Quality Dilemma

- Include or exclude low quality studies?
  - The findings of all studies are potentially in error (methodological quality is a continuum, not a dichotomy)
  - Being too restrictive may restrict ability to generalize
  - Being too inclusive may weaken the confidence that can be placed in the findings
  - Methodological quality is often in the “eye-of-the-beholder”
  - You must strike a balance that is appropriate to your research question

Searching Far and Wide

- Potential sources for identification of documents
  - Computerized bibliographic databases
  - “Google” internet search engine
  - Authors working in the research domain (email a relevant Listserv?)
  - Conference programs
  - Dissertations
  - Review articles
  - Hand searching relevant journal
  - Government reports, bibliographies, clearinghouses

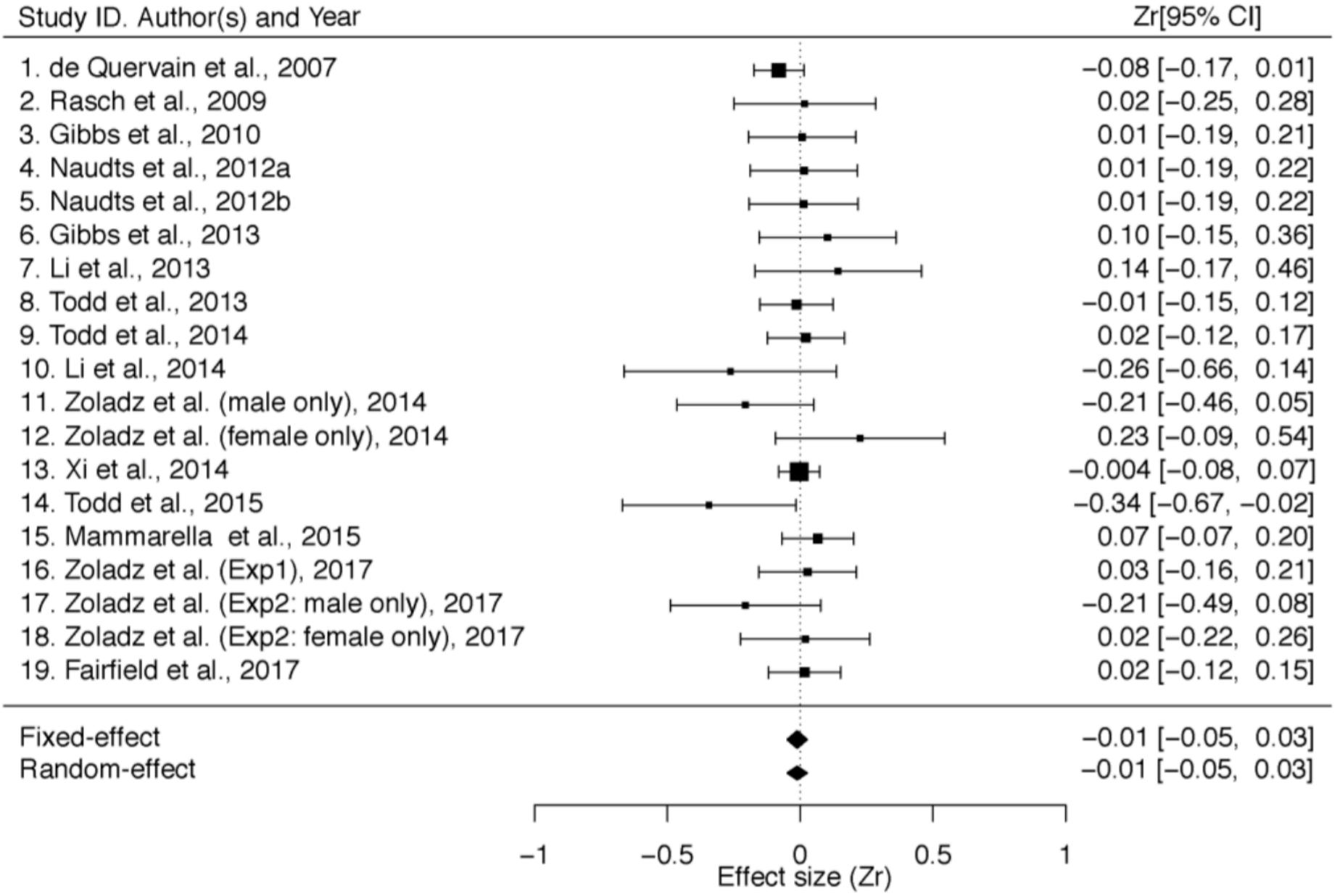
Strengths of Meta-analysis

- Imposes a discipline on the process of summing up research findings
- Represents findings in a more differentiated and sophisticated manner than conventional reviews
- Capable of finding relationships across studies that are obscured in other approaches
- Protects against over-interpreting differences across studies
- Can handle a large numbers of studies (this would overwhelm traditional approaches to review)

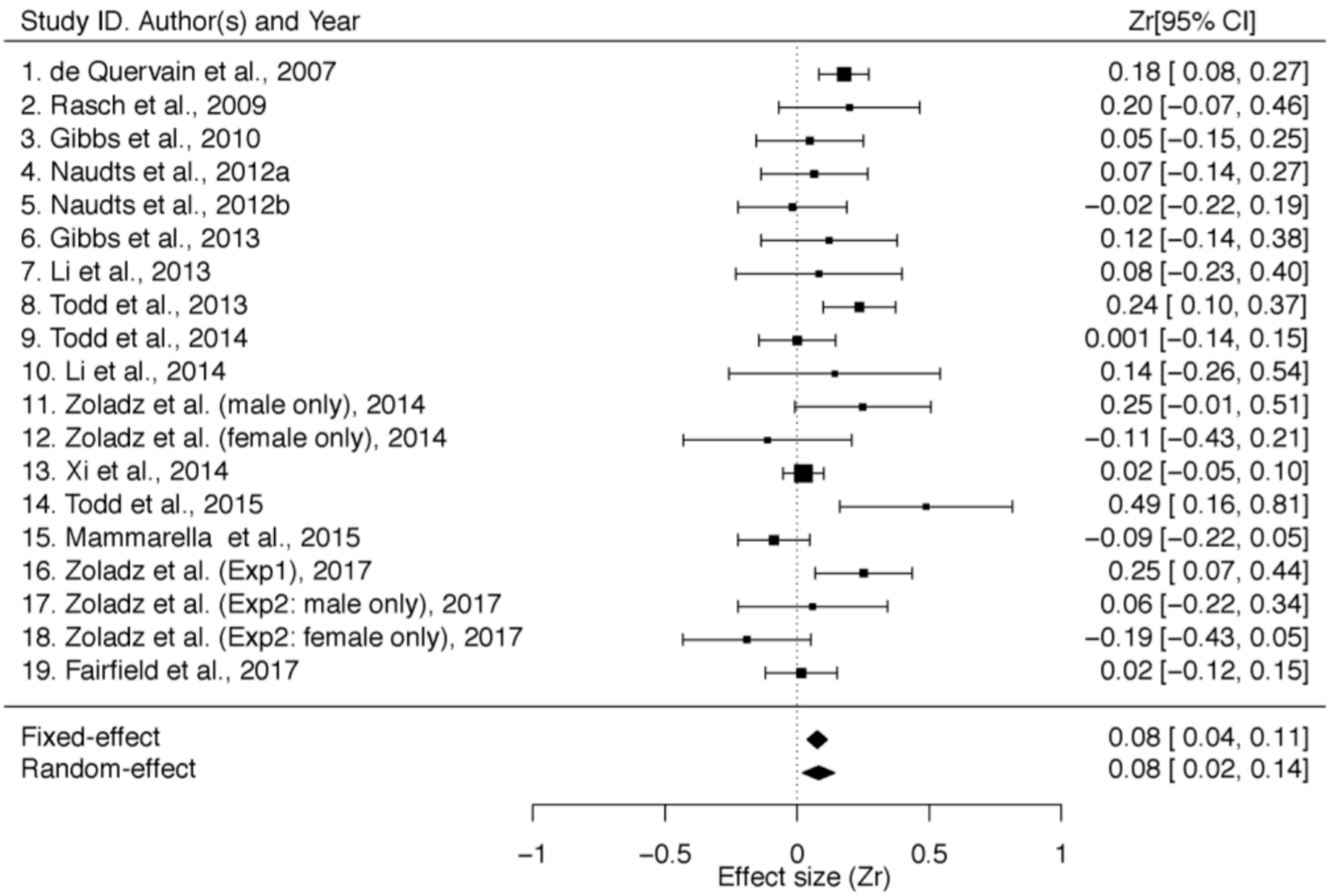
Weaknesses of Meta-analysis

- Requires a good deal of effort
- Mechanical aspects don't lend themselves to capturing more qualitative distinctions between studies
- Selection bias posses a continual threat
  - Negative and null finding studies that you were unable to find
  - Outcomes for which there were negative or null findings that were not reported
- Analysis of between study differences is fundamentally correlational

a). Effect 1: ADRA2B Effect in the Neutral Condition



b). Effect 2: ADRA2B Effect in the Negative (vs. Neutral) Condition



Forest Plot from a Meta-Analysis of Correctional Boot-Camps